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09/364,159	07/30/1999	KOJI SUZUKI	YKI-0014	9014

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EXAMINER	
SCHECHTER, ANDREW M	

ART UNIT	PAPER NUMBER
2871	

DATE MAILED: 05/06/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/364,159	SUZUKI ET AL.	
	Examiner	Art Unit	
	Andrew Schechter	2871	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3 and 6-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *13* is/are allowed.

6)☒ Claim(s) *1,6,8-11 and 16-21* is/are rejected.

7)☒ Claim(s) *2,3,7,12,14 and 15* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 9 February 2004 have been fully considered but they are not persuasive.

The applicants argue [p. 7] that the cited prior art does not disclose the amended limitation of claim 8 that the thickness of the back-surface electrode is greater than 200 Angstroms (which is 20 nm). This is not persuasive. First, *Shintani* discloses that the back-surface electrode is 500 Angstroms thick, so it meets the amended limitation. Second, *Hirano* discloses that the thickness is "about 20 nm". When the prior art discloses a range which touches, overlaps, or is within the claimed range, a case-by-case determination must be made as to whether the claimed subject matter is disclosed in the reference with "sufficient specificity to constitute an anticipation under the statute" [see MPEP 2131.05]. In this case, the prior art range "about 20 nm" touches and overlaps the recited range 'greater than 20 nm'. In the opinion of the examiner, the reference's use of the narrow range "about 20 nm" to describe the thickness is sufficiently specific to constitute anticipation of the broader recited range of 'greater than 20 nm and less than or equal to 150 nm'. The previous rejections in view of *Shintani* and *Hirano* are therefore maintained.

The examiner notes an error in the previous office action, dated 11 August 2003: on p. 6, TiN is listed as a "purely metallic material". Obviously, TiN (titanium nitride) is not purely metallic or a "high melting point metal", and should not have been on this list.

Claim Objections

2. Claims 1, 8, 10, 13, 16, 19, and 21 are objected to because of the following informalities: "reflective type liquid crystal display device" should be "reflective liquid crystal display device" as the use of "type" renders the phrase indefinite [see MPEP 2173.05(b)]. Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claim 8 is rejected under 35 U.S.C. 102(e) as being anticipated by *Hirano*, U.S. Patent No. 6,292,241.

Hirano discloses [see Fig. 3, for example] a method of manufacturing a reflective liquid crystal display device on which display is created by reflecting light incident from the display observation side, comprising:

a step of forming with a back-surface electrode layer [element 12, a Mo layer], a thickness of said back-surface electrode layer is such that no substantial protrusion is formed in the display electrode [E, element 2, see Fig. 3], and the thickness of the back-

surface electrode is greater than 200 Angstroms and less than or equal to 1500 Angstroms [col. 5, line 29, the thickness is "about 20 nm" which touches and overlaps the recited range; see discussion above under *Response to Arguments*];

a step of forming a display electrode [E, element 2] constituted of a reflective material [Al-Nd-Si, an aluminum alloy] on the back-surface electrode layer; and a step of patterning the formed back-surface electrode layer and the display electrode layer to form a surface electrode and a back-surface electrode in the same shape [see Figs. 3B-C], to form a display electrode for reflecting the incident light by a surface thereof [which pixel electrode E does], and the back-surface electrode disposed in contact with the back surface of the display electrode. Claim 8 is therefore anticipated.

5. Claim 8 is rejected under 35 U.S.C. 102(e) as being anticipated by *Shintani et al.*, U.S. Patent No. 5,978,056.

Shintani discloses [see Fig. 4, for instance] method of manufacturing a reflective LCD on which display is created by reflecting light incident from the display observation side, comprising:

a step of forming a back-surface electrode layer [53], a thickness of said back-surface electrode is such that no substantial protrusion is formed in the display electrode, and the thickness of the back-surface electrode is greater than 200 Angstroms and less than or equal to 1500 Angstroms [it is about 500 Angstroms, col. 8, line 55];

a step of forming a display electrode layer [8a] constituted of a reflective material on the back-surface electrode layer; and a step of patterning the formed back-surface

electrode layer and the display electrode layer to forma surface electrode and a back-surface electrode in the same shape [col. 8, lines 58-63, "the layer of Al ... and the anti-reflection film 53 were made into a reflective electrode layer 8a and a final antireflection film 53 by a dry etching process using a given mask pattern"], to form a display electrode for reflecting the incident light by a surface thereof, and the back-surface electrode disposed in contact with the back surface of the display electrode. Claim 8 is therefore anticipated.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1, 6, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Shintani et al.,* U.S. Patent No. 5,978,056 as applied to claim 8 above, and further in view of *Ishii et al.,* U.S. Patent No. 5,566,010 and *Shimada et al.,* U.S. Patent No. 5,182,620.

Considering the limitations of claim 9, *Shintani* further discloses [see Figs. 4-12] a step of forming a transistor [2] on a substrate [1], a step of forming an insulating film [4a] to cover the transistor, a step of forming a contact hole [62] in the insulating film; wherein the back-surface electrode [53] is formed on a smoothened film [4b, col. 6, lines 60-61] with said contact hole [62] formed therein. *Shintani* does not disclose the

remaining limitation of claim 9, that the transistor is a thin film transistor with an active layer of polycrystalline silicon on the substrate. Instead, *Shintani* discloses a MOSFET transistor in silicon.

However, a poly-silicon thin film transistor and a MOSFET transistor are art-recognized equivalents for switching devices in these kinds of LCD devices, as evidenced by *Ishii* [col. 10, lines 10-16]. It would therefore have been obvious to one of ordinary skill in the art at the time of the invention to use a poly-silicon TFT in place of *Shintani*'s MOSFET, motivated by the equivalence of the two structures. In addition, as a specific example, *Shimada '620* discloses [see Fig. 1 and 2] an analogous LCD with a polysilicon TFT structure having an active layer [12] on the substrate [11]. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the polysilicon TFT structure of *Shimada '620* in the device of *Shintani*, motivated by *Shimada '620's* teaching that such polysilicon TFTs are used "because of the high degree of mobility of electrons and holes, and of the possibility of fabricating n-type TFTs and p-type TFTs, thereby making it possible to constitute a CMOS construction" [col. 2, line 20-25]. Claim 9 is therefore unpatentable.

The device made by the method described above, combining *Shintani* with *Ishii* and *Shimada '620*, satisfies all the claim limitations of claims 1 and 6 as discussed above in the context of claims 8 and 9. Claims 1 and 6 are therefore unpatentable.

8. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Colgan et al.,* U.S. Patent No. 6,424,388 in view of *Shinriki et al.,* U.S. Patent No. 5,973,402, with *Lai*, U.S. Patent No. 6,259,185, providing evidence of inherency.

Colgan discloses [see Fig. 1] a method of manufacturing a reflective liquid crystal display device [12] on which display is created by reflecting light [54] incident from the display observation side, comprising:

a step of forming [element 30] a back-surface electrode layer [10 nm Ti, col. 9, lines 22-24], a thickness of said back-surface electrode layer is such that no substantial protrusion is formed in the display electrode [see Fig. 1 showing the display electrode 30 without protrusions, and the discussion (col. 5, lines 46-52, for instance) regarding reducing hillocks or protrusions in the electrode], said back-surface electrode layer is made of titanium [col. 9, lines 22-24];

a step of forming a display electrode [150 nm of Al, col. 9, lines 22-24] constituted of a reflective material on the back-surface electrode layer, said display electrode is made of aluminum; and

a step of patterning the formed back-surface electrode layer and the display electrode layer to form a surface electrode and a back-surface electrode in the same shape [col. 9, lines 25-27, and see Fig. 9], to form a display electrode [30] for reflecting the incident light by a surface thereof, and the back-surface electrode disposed in contact with a back surface of the display electrode [col. 9, lines 22-24].

Colgan does not explicitly disclose the final limitation of claim 19, that the display electrode layer [Al] is in the (111) orientation state.

First, it appears to the examiner that this is an inherent characteristic of *Colgan's* device. An aluminum layer deposited on a titanium layer will be preferentially formed in the (111) orientation state, as evidenced by *Lai* [see abstract, lines 6-8]. Thus, it

appears that *Colgan's* Al layer will be in the (111) orientation state. In this case, claim 19 would be anticipated. [The examiner notes that since *Lai* is provided to evidence a universal fact, it need not antedate the filing date; see MPEP 2131.01.]

Second, assuming that there is some way to form the Al layer on the Ti layer in *Colgan* without having it be in the (111) orientation state (so that it was not the case that it is inherent), it would nonetheless be obvious to form it in the (111) orientation state. *Shinriki* discloses forming an aluminum layer in the (111) orientation state in an analogous semiconductor device, and teaches that doing so is advantageous in that it creates a smooth surface [abstract] and is a means of "insuring long-term reliability" [col. 7, lines 1-3 and abstract]. It would therefore be obvious to one of ordinary skill in the art at the time of the invention to form *Colgan's* Al layer in the (111) orientation state, motivated by *Shinriki's* teaching of the advantages of doing so. Claim 19 is therefore unpatentable.

9. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Nakamura et al.,* U.S. Patent No. 6,124,911 in view of *Colgan et al.,* U.S. Patent No. 6,424,388.

Nakamura discloses [see Figs. 1 and 21, for instance] a method of manufacturing a reflective liquid crystal display on which a display is created by reflecting light incident from the display observation side comprising: a process of forming a thin film transistor [7] with an active layer of polycrystalline silicon [2] on a substrate [1]; a step of forming an insulating film [8] to cover the thin film transistor; and a step of forming a contact hole

[see Fig. 8] in the insulating film, wherein the pixel electrode [16] is formed on a smoothened film [9] with the contact hole formed therein.

Nakamura does not disclose the additional limitations of claim 10, that the pixel electrode is made by a step of forming a back-surface electrode layer made of a high melting point metal, a step of forming a display electrode layer constituted of a reflective material on the back-surface electrode layer, patterning the two layers to form electrodes in the same shape, to form a display electrode for reflecting light and a back-surface electrode disposed in contact with the back surface of the display electrode.

Colgan discloses [col. 9, lines 22-27] forming the pixel electrode for an analogous LCD in exactly this manner, with a 10 nm Ti layer as the back-surface layer and a 150 nm Al layer as the display layer. It would have been obvious to one of ordinary skill in the art at the time of the invention to use *Colgan*'s method of forming the pixel electrode in the device of *Nakamura*, motivated by *Colgan's* teaching that the Ti layer "is used for improved adhesion and contact resistance" [col. 9, lines 24-25] and that this specific Al on Ti structure had improved reflectivity [see Fig. 2, col. 5, line 56 – col. 6, line 8, for instance]. Claim 10 is therefore unpatentable.

The high melting point metal of *Colgan's* back-surface layer is titanium, so claim 11 is also unpatentable.

[The examiner notes that *Colgan* partially discloses the features for which *Nakamura* is relied on above, namely a reflective LCD with polysilicon layers, an insulating layer, and a smoothened layer. However, *Colgan*'s disclosure is unclear as to

whether the polysilicon layers form part of a TFT, for instance, so it does not provide a clear anticipation.]

10. Claims 16-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Nakamura* in view of *Colgan* as applied to claims 10 and 11 above, and further in view of *Shinriki et al.,* U.S. Patent No. 5,973,402, with *Lai*, U.S. Patent No. 6,259,185, providing evidence of inherency.

The only additional limitations of claim 21 over those discussed above regarding claims 10 and 11 are: the back-surface electrode is made of titanium and the display electrode is made of aluminum [as *Colgan* teaches, see above], and that the display electrode is in the (111) orientation state. *Colgan* does not explicitly disclose that the display electrode layer [Al] is in the (111) orientation state.

First, it appears to the examiner that this is an inherent characteristic of *Colgan's* device. An aluminum layer deposited on a titanium layer will be preferentially formed in the (111) orientation state, as evidenced by *Lai* [see abstract, lines 6-8]. Thus, it appears that *Colgan's* Al layer will be in the (111) orientation state. In this case, claim 21 would be unpatentable. [The examiner notes that since *Lai* is provided to evidence a universal fact, it need not antedate the filing date; see MPEP 2131.01.]

Second, assuming that there is some way to form the Al layer on the Ti layer in *Colgan* without having it be in the (111) orientation state (so that it was not the case that it is inherent), it would nonetheless be obvious to form it in the (111) orientation state. *Shinriki* discloses forming an aluminum layer in the (111) orientation state in an analogous semiconductor device, and teaches that doing so is advantageous in that it

creates a smooth surface [abstract] and is a means of "insuring long-term reliability" [col. 7, lines 1-3 and abstract]. It would therefore be obvious to one of ordinary skill in the art at the time of the invention to form *Colgan's* Al layer in the (111) orientation state, motivated by *Shinriki's* teaching of the advantages of doing so. Claim 21 is therefore unpatentable.

Regarding claims 16, the only additional limitations to those discussed above are: the back-surface electrode and the transistor are electrically interconnected, with a portion of the back-surface electrode directly connected to the active layer via the contact hole, and that the thickness of the back-surface electrode is such that no substantial protrusion is formed in the display electrode. The first is disclosed by *Nakamura* for its pixel electrode and active layer, so it would be met by the above-described combination. The second is met by *Colgan's* back-surface electrode and display electrode [see Fig. 1 showing the display electrode 30 without protrusions, and the discussion (col. 5, lines 46-52, for instance) regarding reducing hillocks or protrusions in the electrode], so it would also be met by the above-described combination. Claim 16 is therefore unpatentable.

The active layer in *Nakamura* is polycrystalline silicon, so claim 17 is also unpatentable. The pixel electrode in *Nakamura* (and hence the back-surface electrode in the combination) elongates to a place above a part of the active layer and the contact hole is formed between the one end portion of the pixel electrode and the part of the active layer [see Fig. 21, for instance], so claim 18 is also unpatentable.

Claims 19 and 20 contain only limitations which have been discussed above, so they are both unpatentable.

Allowable Subject Matter

11. Claims 2, 3, 7, 12, 14, and 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

12. Claim 13 is allowed.

13. The following is a statement of reasons for the indication of allowable subject matter:

The prior art does not disclose the reflective LCD of claim 13, in particular the limitations of surface electrode and back-surface electrode in the same shape, back-surface electrode on a smoothened film with a contact hole, and the back-surface electrode made of a high melting point metal and having a thickness greater than 200 Angstroms and less than or equal to 1500 Angstroms. Claim 13 is therefore allowed. Note, however, the objection to claim 13 above under *Claim Objections*.

The prior art does not disclose the device of claims 2 and 7, in particular the limitations from claim 1 that the display and back-surface electrodes are patterned in the same shape, that the back-surface electrode is connected to the TFT's active layer via a contact hole, and has a thickness greater than 200 Angstroms and less than or equal to 1500 Angstroms, and the additional limitation in claims 2 and 7 that the back-surface

electrode is a high melting point metal. Claims 2 and 7 would therefore be allowed if rewritten appropriately, as would dependent claims 3 and 15.

The prior art does not disclose the device of claim 12, in particular the limitations from claim 1 that the display and back-surface electrodes are patterned in the same shape, and that the back-surface electrode is connected to the TFT's active layer via a contact hole and has a thickness greater than 200 Angstroms and less than or equal to 1500 Angstroms, and the additional limitation in claim 12 that the contact hole is formed between the one end portion of the back-surface electrode and the part of the active layer. (*Shintani* discloses that the contact hole is formed between the back-surface electrode and an intermediate layer [9a], rather than between the back-surface electrode and a part of the active element itself.) Claim 12 would therefore be allowable if rewritten appropriately.

The prior art does not disclose the device of claim 14, in particular the limitations from claim 1 that the display and back-surface electrodes are patterned in the same shape, that the back-surface electrode is connected to the TFT's active layer via a contact hole, and has a thickness greater than 200 Angstroms and less than or equal to 1500 Angstroms, and the additional limitation in claim 14 that the back-surface electrode is made of a non-oxide metal. Claim 14 would therefore be allowable if rewritten appropriately.

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent No. 5,973,402 to *Shinriki et al.* discloses and teaches forming an electrode of aluminum in the (111) orientation state on a layer of TiN which is on a layer of titanium. This differs from the present claims in that the scope of the present claims excludes an intermediate layer of TiN between the aluminum and titanium electrodes.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew Schechter whose telephone number is (571) 272-2302. The examiner can normally be reached on Monday - Friday, 9:00 - 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert H. Kim can be reached on (571) 272-2293. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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30 April 2004